

## Eye in the Sky

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*Review of Beyond 2001: Odysseys of intelligence, Espacio Fundación Telefónica, Madrid. 31 Oct 2018 – 17 Feb 2019.*

Against the backdrop of increasing excitement and worry about the formidable advances in artificial intelligence (AI) made in the last few years, it is meaningful to review our expectations about this subject through contemporary culture and art, and historical perspectives. This was cleverly achieved by "*Beyond 2001: Odysseys of Intelligence*", an exhibition curated by Claudia Giannetti and recently hosted by the Espacio Fundación Telefónica in Madrid (31 Oct – 17 Feb).

The exhibition takes its inspiration from Stanley Kubrick's unforgettable sci-fi movie "*2001: A Space Odyssey*" and deconstructs it into a set of key themes and questions. What does it take to make intelligence morph and evolve – first, together with our biological structures and then, outside of them? This is a kind of general question with which one could approach the exhibition, and possibly no movie could provide a more compelling framework to think about human and artificial intelligence and their relationship.

Indeed, the exhibition takes inspiration from the three section structure of *2001: A Space Odyssey* to guide its own review of the state of the art of AI and its future. The first part of the movie concerned the evolution of human intelligence from primates – the ape that 'discovers' how to use a bone as a hammer and takes a new path towards a radical reorganisation of cognitive and social structures – and the exhibition reminds us of the parallel evolution of our thinking about this question. After all, many animals exhibit complex tool-use behaviours without ever transcending the animal-tool system they make. The exhibition reminds us how, with the subsequent advances in the cognitive and computational sciences over the last century and a half, the evolutionary tree can be juxtaposed to cognitive trees – both those that we find in the brain (represented here by some beautiful century old drawings of Santiago Ramón Y Cajal), and those that we build *in silico*. It makes us wonder: are we creating, in the computing machine, a new tool for the next "leap" of intelligence into new forms of embodiment? The difference

between an evolution that mostly happened to us through innumerable small steps in time, and that which we are purporting to engineer in electronics, should not pass unnoticed. The exhibition, like the movie itself, suggests the case might not be settled smoothly.

The second and largest part of the exhibition maps Hal 9000's capabilities – such as vision, learning, planning, search and reasoning, and speech and language processing – to today's key research areas in AI. Each capability is the end point of entire programmes of research, and we are reminded about what an exotic machine this fifty year-old imagined computer is still today. How will Hal's 'strong' AI emerge through the eventual integration of these different fields?

This section reviews the state of the art through a checklist of key questions including: What is artificial intelligence? Can a machine think? Can AI be creative? Can an AI master human language? Can AI act autonomously? Can an AI system control us? Can AI change our lives? Can AI have emotions? What will human intelligence be for AI? For each of these, what HAL 9000 can do is contrasted to the track record to date.

Take the best popularized application, board game play. HAL 9000 won a chess game against a human in the movie and, less than 50 years later, machines that can play chess and go! have also beaten human intelligence. This completing a long line of attempts that the exhibition tracks back to the functioning automaton developed by Leonardo Torres Quevedo a century earlier in 1912. In another compelling juxtaposition, we can contrast HAL 9000's malfunctions and their damaging consequences with events such as the 'flash crashes' of Western stock markets caused by trading algorithms. This is explored by 'Traders 2018', a multimedia data visualization by Daito Manabe, You Tanaka, Kenichiro Shimizu and Shogo Kawata (Goraku). Also, parallels between HAL 9000's ability to visually surveil the astronauts secretly plotting rebellion can be drawn with the advances made by Chinese companies and government in visual recognition software that can recognise and track crowds, as examined in the documentary 'Next Level Surveillance' by Paolo Bosonin, Daniel Epstein and Josh Chin, and with the 'Data | *ergo sum*' interactive installation (by Ana Marcos, Alfonso Villanueva and Iury Lech), which analyses short image streams of individual audience members and displays them augmented with analytics about both biometrics and social and emotional attitudes. Even HAL 9000's artistic sense has been emulated in the real world, and we are shown a machine that can draw a (rather uninspired) portrait of a live subject.

The third section investigates the potential for future AI to become more human like – will computers learn to process emotions? This is crucial if AI will ever fulfil a posthumanist transcendence from its origins in human wet-ware, but here the distinction between sci-fi literature and real world prospects seems more blurry. Impressive progress has been made in

individual tasks, but we can legitimately wonder what it would take to integrate a chess-playing machine with a portrait-drawing one: it seems a safe guess that we would get one rather strange kind of disembodied Frankenstein.

How all these deep forays in human intelligence emulation will eventually come together seems to be a potential problem that the exhibition is not comfortable to tackle. The most interesting point here is not to make a binary prediction about whether we will build higher intelligence, but what are the key points we must evaluate as we do. The exhibition closes with clips of interviews with Arthur C Clarke and Marvin Minsky, who did not have much doubt that every inconsistency will be smoothed out. But still, the exhibition leaves us wondering if anyone knows for sure. Not knowing did not obstruct the emergence of our own human intelligence, so for the positively hopeful, this might not be bad news after all.

It might be that no other movie will ever match how Kubrick captured our imagination about the future of intelligence, back in 1968. Fifty years from now, new exhibitions will possibly celebrate its centenary, but perhaps other productions will be remembered for how they opened up more questions, expectations and anxieties. For instance, Spike Jonze's *Her* (2013) is a powerful exploration of AI, and its consequences for the emotional lives of humans; *Ex Machina* (2014), as well as the series 'Westworld', investigates themes of meta-consciousness, identity and antagonism in higher embodied artificial intelligence; and with *Wall-E*, now 10 years old, even child-oriented animations have invited us to think about artificial emotional intelligence.